http://hdl.handle.net/2027.42/64943
Research Design

Contributors
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Design Characteristics

- Maximizes control over factors to increase the validity of the findings
- Guides the researcher in planning and implementing a study
Level of Control: Quantitative Research

- Descriptive
- Correlational
- Quasi-experimental
- Experimental

Increased Control with Design
Concepts Relevant to Research Design (1)

Causality

\[ A \rightarrow B \]
Pressure \[ \rightarrow \] Ulcer

Multicausality

\[ \text{Years smoking} \rightarrow \text{Heart disease} \]
\[ \text{High fat diet} \rightarrow \text{Heart disease} \]
\[ \text{Limited exercise} \rightarrow \text{Heart disease} \]
Concepts Relevant to Research Design (2)

- Probability: Likelihood of an outcome
- Bias: Slanting findings
- Manipulation: Treatment
- Control: All phases of design
Design Validity

- Measure of accuracy of a study

- Examined with critique of the following dimensions:
  - Statistical conclusion validity
  - Internal validity
  - Construct validity
  - External validity
Elements of a Strong Research Design (1)

- Controlling the environment of the study setting

- Levels of controlling:
  - Natural setting
  - Partially controlled setting: e.g., clinics
  - Highly controlled setting: e.g., laboratory
Elements of a Strong Research Design (2)

- Controlling the equivalence of subjects and groups
  - Random subject selection
  - Random assignment to groups
• Controlling the treatment

  o Choose a treatment based on research and practice
  o Develop a protocol for implementation
  o Document the implemented treatment
  o Use a check-list to determine the extent of completeness to which the treatment was implemented
  o Evaluate the treatment during the study
Elements of a Strong Research Design (4)

- Controlling measurement
  - Reliability
  - Validity
  - Number of measurement methods
  - Types of instruments
Elements of a Strong Research Design (5)

- Controlling extraneous variables
  - Identify and eliminate extraneous variables via sample criteria, choice of settings, or research design
  - Random sampling
  - Sample: Heterogenous, homogeneous, or matching
  - Statistical control
Problems with Study Designs

- Inappropriate for the study purpose or the research framework
- Poorly developed designs
- The research methods were poorly implemented
- Inadequate treatment, sample, or measurement methods
Selecting a Design

Is there a treatment?

- No
  - Is the primary purpose examination of relationships?
    - No
      - Descriptive Design
    - Yes
      - Will the sample be studied as a single group?
        - No
          - Correlational Design
        - Yes
          - Quasi-Experimental Study
  - Yes
    - Is the treatment tightly controlled by the researcher?
      - No
        - Will a randomly assigned control group be used?
          - No
            - Is the original sample randomly selected?
              - No
                - Experimental Study
              - Yes
                - Yes
      - Yes
        - Yes

Research Design
Selecting a Descriptive Design

Examining sequences across time?
- Yes
- No

One Group?
- No
- Yes

Comparative Design
- Descriptive Design

Data collected across time?
- No
- Yes

Cross-sectional design
- Studying events partitioned across time?
- No
- Yes

Trend Analysis
- Repeated measures of each subject
- Yes
- No

Longitudinal Study

Case Study

Research Design

Cross-sectional design
- with treatment partitioning

Longitudinal design with treatment partitioning
A Typical Descriptive Design

- **Clarification** → **Measurement** → **Description** → **Interpretation**

  - **Variable 1**
  - **Variable 2**
  - **Variable 3**
  - **Variable 4**

  - Description of Variable 1
  - Description of Variable 2
  - Description of Variable 3
  - Description of Variable 4

  **Interpretation of Meaning**

  **Development of Hypotheses**
A Comparative Descriptive Design

Group I
{variables measured}

Describe

Comparison of Groups on Selected Variables

Interpretation of Meaning

Group II
{variables measured}

Describe

Development of Hypotheses
## Selecting the Type of Correlational Design

<table>
<thead>
<tr>
<th>Describe relationships between/among variables?</th>
<th>Predict relationships between/among variables?</th>
<th>Test theoretically proposed Relationships?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Descriptive correlational design</td>
<td>Predictive correlational design</td>
<td>Model testing design</td>
</tr>
</tbody>
</table>
A Descriptive Correlational Design

**Measurement**

- Research Variable 1
  - Description of variable
  - Examination of Relationship
  - Interpretation of Meaning

- Research Variable 2
  - Description of variable
  - Development of Hypotheses

Research Design
A Predictive Design

\[
\text{Value of Intercept} + \text{Value of Independent Variable 1} + \text{Value of Independent Variable 2} = \text{Predicted Value of Dependent Variable}
\]
Selecting The Type of Quasi-Experimental Design

- Control Group?
  - Yes
    - Pretest?
      - Yes
        - Repeated Measures?
          - Yes
            - Strategy for Comparison
              - No
                - Suggest Reevaluating design
                - One group pretest/post-test design
              - Yes
                - Compare treatment & control conditions?
      - No
  - No
    - Pretest?
      - Yes
        - Repeated Measures?
          - Yes
            - Strategy for Comparison
              - No
                - Suggest Reevaluating design
                - One group pretest/post-test design
          - No
            - Strategy for Comparison
              - No
                - Suggest Reevaluating design
                - One group pretest/post-test design
          - Yes
            - Compare treatment & control conditions?
Selecting The Type of Experimental Design

Pretest

No

Post-test only control group design

Yes

Repeated Measurements?

No

Examine effects of confounding variables?

No

Multiple sites?

Pretest/post-test control group design

Yes

Yes

Repeated measures design

No

Randomized clinical trials

No

Comparison of multiple levels of treatment

No

Examination of complex relationships among variables in relation to treatment

Yes

Yes

Randomized Block Design

Yes

Nested Designs

Research Design
Pretest-Post Test, Control Group Designs

<table>
<thead>
<tr>
<th>Measurement of dependent variables</th>
<th>Manipulation of independent variables</th>
<th>Measurement of dependent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomly selected experimental group</td>
<td>PRETEST</td>
<td>TREATMENT</td>
</tr>
<tr>
<td>Randomly selected control group</td>
<td>PRETEST</td>
<td>POST-TEST</td>
</tr>
</tbody>
</table>

**Treatment:** Under control of researcher

**Findings:**
- Comparison of pretest and post-test scores
- Comparison of experimental and control groups
- Comparison of pretest-post-test differences between samples

**Example:**
Your self (1990). The impact of group reminiscence counseling on a depressed elderly population.

**Uncontrolled threats to validity:**
- Testing
- Mortality

**Instrumentation:**
- Restricted generalizability as control increases
Post-Test-Only Control Group Design

<table>
<thead>
<tr>
<th>Randomly selected experimental group</th>
<th>TREATMENT</th>
<th>POST-TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomly selected control group</td>
<td></td>
<td>POST-TEST</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measurement of independent variables</th>
<th>Measurement of dependent variables</th>
</tr>
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</table>

Treatment: Under control of researcher

Findings: Comparison of experimental and control groups


Uncontrolled threats to validity:
- Instrumentation
- Mortality
- Limited generalizability as control increases
## Nested Design

### Pain Control Management

<table>
<thead>
<tr>
<th>Traditional care</th>
<th>PRN Medication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit A</td>
<td>Unit E</td>
</tr>
<tr>
<td>Unit B</td>
<td>Unit F</td>
</tr>
<tr>
<td>Unit C</td>
<td>Unit G</td>
</tr>
<tr>
<td>Unit D</td>
<td>Unit H</td>
</tr>
</tbody>
</table>

### Primary Nursing Care

<table>
<thead>
<tr>
<th>Primary Care</th>
<th>No Primary Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit A</td>
<td>Unit B</td>
</tr>
<tr>
<td>Unit C</td>
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Advantages of Experimental Designs

- More controls in design and conducting a study
- Increased internally validity
  - Decreased threats to design validity
- Fewer rival hypotheses
Advantages of Quasi-Experimental Designs

- More practical
  - Ease of implementation
- More feasible
  - Resources, subjects, time, setting
- More generalizable
  - Comparable to practice
Developing the Design Section of Your Proposal

• Identify the design
  ○ Name it specifically

• Provide a map of the design
• Discuss your rationale for using this design
• Describe threats to the validity of the chosen design